

DSF d

Dec 7 1948

47-195  
c.7.  
700

OAK RIDGE NATIONAL LABORATORY

CENTRAL FILES NUMBER

48-12-104

Date December 7, 1948

File 48-12-104

Subject Radiation Hazards Measurements

Those Eligible  
To Read The  
Attached

For The Period November 26 to December 3.

By C. P. Coughlen, S. E. Beall

Copy # 9

To C. E. Winters

Before reading this document, sign and date below:



Name \_\_\_\_\_ Date \_\_\_\_\_

Name \_\_\_\_\_ Date \_\_\_\_\_

RUS 25 Feb 1949

CF

DISTRIBUTION

1. C. E. Winters
2. J. A. Lane
3. F. L. Culler
4. E. O. Wollen
5. K. Z. Morgan
6. L. B. Emlet
7. E. Witkowski
8. J. A. Swartout
9. R. W. Stoughton
10. E. J. Murphy
11. C. P. Coughlen
12. S. E. Beall
13. D. G. Reid
14. Central Files
15. Reading Files

"This document contains restricted data within the meaning of the Atomic Energy Act of 1946 and/or information affecting the National defense or the United States within the meaning of the Espionage Act, 50 U.S.C. 31 and 32 as amended. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited and may result in severe criminal penalty."

ChemRisk Document No. 1864

TRANSMITTAL DATED .....

~~SECRET~~

This document consists of 10 pages.  
No. 2 of 15 copies. Series A.

To: C. E. Winters

From: C. P. Coughlen, S. E. Beall

Subject:

CLASSIFICATION CANCELLED

DATE 9/6/67

For The Atomic Energy Commission

*H. P. Canale*  
Chief, Declassification Branch

Waste Activity Report - Rala Run - November 17 to November 22, 1948

C. P. Coughlen

### Introduction

This report presents the corrected results of the sampling during the recent Rala run. Analyses, operating times, aliquots used for analysis, etc., were carefully reviewed and corrections of previously published results made where necessary. The values are reported per run.

Electroscope readings on most of the samples indicate half-lives of 6-8 days for the period 5 to 12 days after sampling. These data are not further reported herein.

The reader is cautioned to make few, if any, quantitative interpretations from this report but rather to view the information as qualitative indications obtained during a preliminary, crude run.

Refinements to be included in the next analysis of a Rala run include:

1. All samplers are to be isolated one from the other.
2. Quick closure features and stiff filter supports will permit paper and jar samples across each major step.
3. Electroscope readings for decay determinations will be started immediately on removal. Samples can be sent for analysis very soon after sampling.
4. Sampling of the vessel off-gas line (A-16) after the FG filter will be done ahead of the 205 large duct instead of in the duct to increase the sampling ratio to ca. 30% instead of ca. 0.1%.

### 706-D Dissolver Off-Gas Line (A-4205)

#### CWS Filter Paper-Sample C-2

1. Sample Point - adjacent to 706-D Building, before FG filter.

2. Period Sampled- slug dissolving (6 AM to 7 PM, 11/18/48) plus last  $3\frac{1}{2}$  hours of heel dissolving, plus  $21\frac{1}{2}$  hours of no logged operations.
3. Integrated flow through sampler - 7.2 CFM.
4. Integrated A-4205 Line flow - 26.2 CFM.
5. Sampling Ratio - 27.5%
6. % Total Paper counted - 0.833%
7. Reported Gross Gamma on paper sample counted -  $7.12 \times 10^8$  d/m
8. Total millicuries  $\gamma$  on paper - 38.3
9. Total millicuries  $\gamma$  had entire stream been sampled- 139 ; analyses made  $7\frac{1}{2}$  days after end of slug dissolving.

Cyclone Sample - Sample C-2

This jar was spilled on removal and covered the first 10 hours of slug dissolving. Cutie Pie readings indicated the fluid in the jar was quite active on the order of R's at jar contact. Sample Point- adjacent to 706-D Building, before FG filter.

Cyclone Sample - Sample C-3

1. Sample Point - adjacent to 706-D Building, before FG filter.
2. Period Sampled- last three hours of slug dissolving, plus fifteen hours of no logged operations. (4 PM, 11/18 to 10 AM, 11/19).
3. Integrated Flow through Sampler- 3.8 CFM
4. Integrated A-4205 Line Flow - 18.5 CFM
5. Sampling Ratio - 20.5%.
6. % Total Solution Counted- 0.13%
7. a. Reported Gross Gamma per 0.13% of sample -  $8.38 \times 10^7$  dis/min.  
b. Reported Gross Beta per 0.13% of sample -  $4.81 \times 10^7$  dis/min.
8. a. Total millicuries  $\gamma$  in sample - 28.9  
b. Total millicuries  $\beta$  in sample -16.6
9. a. Total millicuries  $\gamma$  had entire stream been sampled - 141  
b. Total millicuries  $\beta$  had entire stream been sampled - 81

Note: Analyses run 10 days after removal of sample.

Cyclone Sample C-4

1. Sample Point - adjacent to 706-D Building, before FC filter.
2. Period Sampled - Final  $3\frac{1}{2}$  hours (of 14) of heel dissolving plus  $6\frac{1}{2}$  hours of no logged operations (11PM, 11/19 to 9 AM, 11/20).
3. Integrated flow through sampler - 3.5 CFM
4. Integrated A-4205 Line Flow - 30.5 CFM
5. Sampling Ratio - 11.5%
6. % total solution counted - 100%
7. a. Reported Gross Gamma -  $2.05 \times 10^{10}$  dis/min.  
b. Reported Gross Beta -  $2.28 \times 10^{10}$  dis/min.
8. a. Total millicuries  $\gamma$  in sample - 9.1  
b. Total millicuries  $\beta$  in sample - 10.2
9. a. Total millicuries  $\gamma$  had entire stream been sampled - 79  
b. Total millicuries  $\beta$  had entire stream been sampled - 89

Note: Analyses run 4 days after sample removal.

CWS Filter Paper - Sample 1-2

1. Sample Point - near base of 205 stack, after FC filter.
2. Period Sampled - entire Rala run after jacket removal (6 AM, 11/18 to 2:30 PM, 11/21)
3. Integrated flow through sampler - 14.4 CFM
4. Integrated A-4205 Line Flow - 20.1 CFM.
5. Sampling Ratio - 71.7%
6. % Total paper counted - 0.833%
7. Reported Gross Gamma on paper sample counted -  $5.15 \times 10^8$  dis/min.
8. Total millicuries  $\gamma$  on paper - 23.1
9. Total millicuries  $\gamma$  had entire stream been sampled - 32.2 ; analyses made  $7\frac{1}{2}$  days after end of slug dissolving.

~~SECRET~~

Cyclone Samples - Sample L-2, L-3, and L-4

1. Sample Point - near base of 205 stack, after FG filter.
2. Period Sample - entire Rala run after jacket removal.  
(6 AM, 11/18 to 2:30 PM, 11/21/48)
3. Integrated Flow Sampler - 14.4 CFM
4. Integrated A-4205 Line Flow - 20.1 CFM
5. Sampling Ratio - 71.7%
6. % total fluid counted - 100%
7. a. Reported Gross Gammas on bottles
 

L-2	$1.50 \times 10^9$	dis/min.
L-3	$0.83 \times 10^9$	dis/min.
L-4	$3.56 \times 10^9$	dis/min.
Total	$5.89 \times 10^9$	dis/min.
- b. Reported Gross Beta on bottles
 

L-2	$2.01 \times 10^9$	dis/min.
L-3	$0.55 \times 10^9$	dis/min.
L-4	$1.42 \times 10^9$	dis/min.
Total	$3.98 \times 10^9$	dis/min.
8. a. Total millicuries  $\gamma$  in samples - 2.64
- b. Total millicuries  $\beta$  in samples - 1.78
9. a. Total millicuries  $\gamma$  had entire stream been sampled - 3.68
- b. Total millicuries  $\beta$  had entire stream been sampled - 2.48 ;  
Analyses made 1 to 10 days after samples withdrawn.

Discussion of Dissolver Off-Gas Line

Note that gamma activities for the filter papers before and after the FG filter are in the ratio of 139 to 32.2 despite the fact that the paper after the filter was exposed to the entire run while the upstream paper received only the slug dissolving plus a small part of the heel dissolving. This is in disagreement with electroscope readings made  $5\frac{1}{2}$  days after completion of slug dissolving on the exposed papers. Those readings, and all those made after that time, indicate the downstream filter paper to be hotter by a factor of about 1.3.

A point of interest that may be significant is that the condensate collected after the FG filter was quite cool, while that collected ahead of the filter was quite active.

Summing the total activities caught at station L (near 205 stack), the total of 35.9 millicuries of  $\gamma$  activity would have been exhausted to the atmosphere had the sampling unit not been in the line. This value represents a minimum.

Summing for comparison the measured activities prior to the FG filter (representing only a portion of the activities passing through the line at that point) there is obtained 359 millicuries of  $\gamma$  activity.

It is doubtful if more than qualitative consideration should be given to the results of this preliminary run.

706-D Vessel Off-Gas Line (A-16)

CWS Filter Paper - Sample d-2

1. Sample Point - adjacent to 706-D, before FG filters.
2. Period sampled - 6:00 PM, 11/18 to 4:00 AM, 11/20 when blower froze. Initial use of A-16 was at 7:00 PM, 11/18. This period represents but about 60 % of total line usage.
3. Integrated flow through sampler - 15.9 CFM
4. Integrated flow through A-16 line - 69 CFM
5. Sampling Ratio- 23%
6. % total paper counted - 0.833%
7. Reported Gross Gamma on sample counted -  $4.97 \times 10^9$  dis/min
8. Total millicuries  $\gamma$  on paper - 257
9. Total millicuries  $\gamma$  had entire line been sampled for the sampling period - 1165. Analyses made 6 days after sampling ceased.

Cyclone Sample Sample D-3

1. Sample Point - adjacent to 706-D, before FG filters
2. Period sampled - 6:00 PM, 11/18 to 4:00 AM, 11/20 when blower froze. Initial use of A-16 was at 7:00 PM, 11/18. This period represents but about 60 % of total line usage.
3. Integrated flow through sampler - 15.9 CFM
4. Integrated flow through A-16 line - 69 CFM
5. Sampling Ratio- 23%

6. % sample counted - 0.254%
7. a. Reported Gross Gamma per 0.254% sample -  $2.43 \times 10^8$  dis/min  
b. Reported Gross Beta per 0.254% sample -  $1.30 \times 10^8$  dis/min
8. a. Total millicuries  $\gamma$  in sample - 40.7  
b. Total millicuries  $\beta$  in sample - 23.0
9. a. Total millicuries  $\gamma$  had entire stream been sampled - 176  
b. Total millicuries  $\beta$  had entire stream been sampled - 90.5  
Analysis made 6 + days after sampling ceased.

CWS Filter Paper - Samples f5, f6, and f7

1. Sample Point - from large 205 stack duct
2. Period sampled - entire Rala run.
3. Integrated flow through sampler - 18.3 CFM
4. Integrated flow through duct - 20,000 CFM
5. Sampling ratio -  $9.15 \times 10^{-2}$  %
6. % of sample counted - 100%
7. a. Reported Gross Gamma on f-5 -  $5.0 \times 10^8$  dis/min.  
b. Reported Gross Gamma on f-6 -  $3.99 \times 10^8$  dis/min.  
c. Reported Gross Gamma on f-7 -  $0.48 \times 10^8$  dis/min.  
Total -  $9.47 \times 10^8$  dis/min.
8. Total millicuries  $\gamma$  on papers - 0.425
9. Total millicuries  $\gamma$  had entire stream been sampled - 465.  
Analyses made 1 day after paper removals.

Cyclone Samples - F-7, F-8, and F-9

1. Sample Point - from large 205 stack duct
2. Period sampled - entire Rala run.
3. Integrated flow through sampler - 18.3 CFM
4. Integrated flow through duct - 20,000 CFM
5. Sampling ratio -  $9.15 \times 10^{-2}$  %

6. % samples counted - 100%
7. a. Reported Gross Gamma on f-7 - Background  
 b. Reported Gross Gamma on f-8 -  $1.00 \times 10^5$   
 c. Reported Gross Gamma on f-9 - Background  
 Total  $1.00 \times 10^5$
8. Total millicuries  $\gamma$  on papers -  $0.45 \times 10^{-4}$
9. Total millicuries  $\gamma$  had entire stream been sampled 0.049.  
 Analyses made 1 day after jar removals

#### Discussion of Vessel Off-Gas Line

It is difficult to compare the before and after activities (FG filter) here because of (1), the difficulty with the "before" filter-pump freezing, and (2) the extremely small sampling ratio for the "after" filter.

An unreliable comparison can be made by expanding the "before" value to the full run.

This results in  $\frac{1165 + 176}{.6} = 2235$  millicuries of  $\gamma$  activity

This compares with 465 millicuries (after filter) in the ratio of 4.8 to 1.

#### 706-D Cell Ventilation Line

##### CWS Filter Paper- Sample e-1

1. Sample point - just ahead of fan.
2. Period sampled - entire run
3. Integrated flow through sampler - 7.6 CFM
4. Integrated flow through line - 2140 CFM
5. Sampling ratio - 0.355%
6. % total paper counted 0.833%
7. Reported Gross Gamma on sample counted -  $9.88 \times 10^8$  dis/min.
8. Total millicuries  $\gamma$  on paper - 53.2
9. Total millicuries  $\gamma$  had entire line been sampled - 15,000.  
 Analyses made 4 days after sampling ceased.



Cyclone Sample - Sample E-1

1. Sample point - just ahead of fan.
2. Period sampled - entire run.
3. Integrated flow through sampler - 7.6 CFM
4. Integrated flow through line - 2140 CFM
5. Sampling ratio - 0.355%
6. % total sample counted - 100%
7. a. Reported Gross Gamma on sample -  $1.25 \times 10^9$  dis/min  
b. Reported Gross Beta on sample -  $1.34 \times 10^9$  dis/min.
8. a. Total millicuries  $\gamma$  in sample - 0.471  
b. Total millicuries  $\beta$  in sample - 0.601
9. a. Total millicuries  $\gamma$  had entire stream been sampled - 133  
b. Total millicuries  $\beta$  had entire stream been sampled - 169

Analyses made 1 day after sampling ceased.

Evaporator Pilot Plant

S. E. Beall

The pilot plant for the evaporation of radioactive waste streams has been in operation for one week. During this time one run was completed in which 5,000 pounds of waste solution was concentrated to 500 pounds in 48 hours operation. On the basis of the results of this single complete run the following preliminary statements may be made:

Decontamination

1. The amount of sludge in the feed stream is very important. Decontamination is affected by sludge content in two ways:
  - a. The activity of the feed stream is largely determined by the sludge content of the stream. Clear supernate in Run No. 1 counted approximately  $2 \times 10^5 \beta$ 's/ml/min. and approximately  $2 \times 10^3 \gamma$ 's/ml/min, whereas the activity of a representative sample of sludge and supernate counted  $2$  to  $4 \times 10^6 \beta$ 's/ml/min. and  $4$  to  $8 \times 10^3 \gamma$ 's/ml/min. Thus by removing the sludge from the feed stream a decontamination factor of 10 to 20 may be realized.

- b. The activity in the condensate from the evaporator condenser varies with the activity of the material in the evaporator although the decontamination factor is fairly constant at  $10^3$  to  $10^4$ . Condensate activities increased from  $10^2$  to  $10^3$  counts/ml/min as the evaporator increased from  $5 \times 10^5$  to  $5 \times 10^6$ .

Analysis now in progress should show what specific activities are being carried to the condenser and whether this carry-over is due to entrainment (as is suspected) or to volatiles.

#### Scale Formation and Heat Transfer Coefficient

Scale formation may be affected by the amount of sludge in the evaporator. For the duration of run No. 1, however, no significant change in heat transfer coefficient could be detected. A coefficient of approximately 150 Btu/hr/ft<sup>2</sup>/°F remained fairly constant throughout the run, decreasing slightly toward the end. Longer operation will be necessary to determine rate of scale build up.

After completion of Run No. 1, the jet from Tank W-5 was raised 4 feet so that clear feed solution could be obtained. Run No. 2 has been started and will continue until 10,000 pounds feed solution have been concentrated to 500 pounds at the rate of approximately 100 pounds per hour, using 20 pounds steam pressure.

C. P. Coughlen  
C. P. Coughlen

S. E. Beall

gd

~~SECRET~~